VALLEY FILLING BY INTERMITTENT STREAMS

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Streams having steep grades are usually thought to be in active vertical erosion. The writer finds, however, that many intermittent streams are not degrading but are actively aggrading parts or all of their valleys. One of the best examples of such valley filling is that of Jewell's Creek, described in this article.

This little valley is found on the right bank of the Huron River about two miles above the city of Ypsilanti. The Ann Arbor sheet (U.S.G.S.) shows it as a mere ravine to the west of the little settlement of Superior. The accompanying map shows that the valley is about eight hundred and fifty feet long and that the headwaters are eighty-five feet above the Huron River. The line marking the west boundary of the map is on the line of a fence. The land to the west is under cultivation. The main stream has two tributaries, one from the southwest which enters near the mouth, and another from the northwest, joining the main stream near the head waters. Both of these branches head into cultivated fields.

The main valley is divided into two distinct parts. Above where the forty-five-foot contour line crosses the valley, the flow of the water is intermittent. The floor is thereby mostly dry and covered with a species of grass that can live under dry conditions for part of the year. Below the forty-five-foot contour line the flow of water is constant throughout the year. Here the bottom is mostly wet and covered with swamp grass, which greatly retards the flow of water. Fig. 2, taken from a point near the mouth, gives a good idea of the lower part of the valley; while Fig. 3 gives a view of the middle portion just above the crossing of the forty-five-foot contour. The stump shown in the face of the small cliff in the foreground is indicated on the map by the letter *S*, the trees are indicated by circles, and the cattle are standing just about where the fifty-foot contour line crosses the flat bottom of the

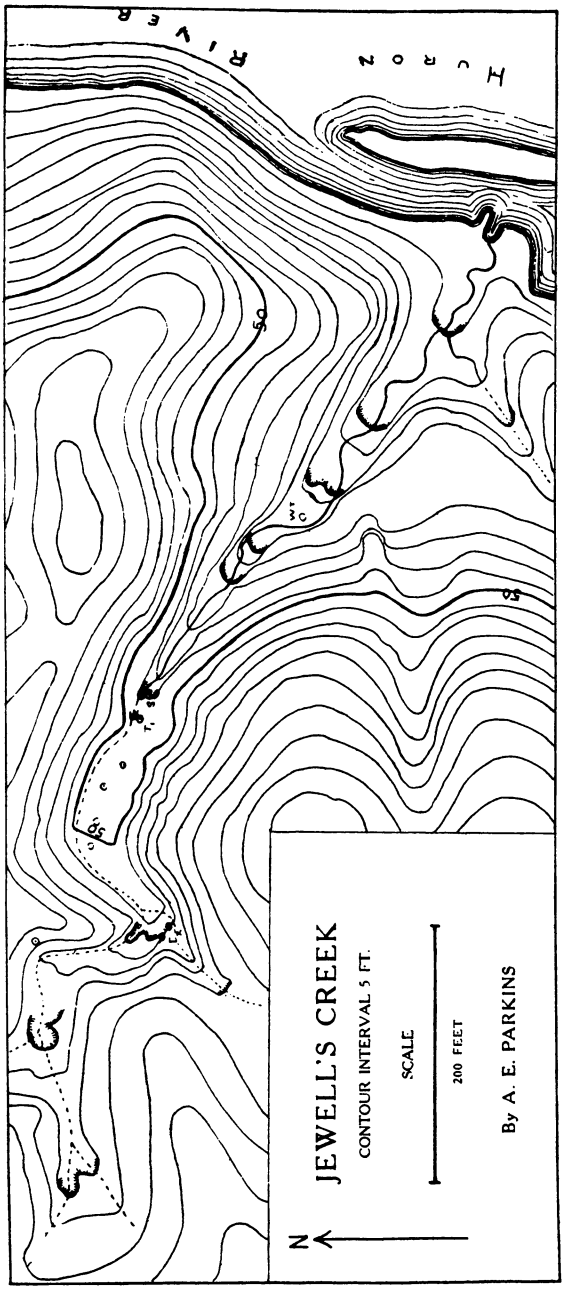
RIVER
HOOK
JEWELL'S CREEK
CONTOUR INTERVAL 5 FT.
SCALE
200 FEET
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FIG. 1

valley. From both the pictures and the map we see that throughout the whole valley we have steps and above each step the valley bottom is flat floored. Only at one point in the valley, just below the forty-five-foot point, is it V-shaped.

The flat floor indicates filling. This is best seen perhaps in Fig. 3. This view also gives other convincing evidences. The sharp angle between the valley sides and bottom is a good evi-

FIG. 2.—The lower part of the valley. In this part there is a continuous flow of water throughout the year, it being below the water table. The water course is much choked with grass. One step may be seen just this side of the tree, a walnut, in the valley bottom near the middle of the picture. On the map the location of the tree is designated by *W. T.*

dence, the buried "feet" of the trees is another, and the most convincing of all is the position of the stump in the face of the bank or cliff. Just above the roots, where the surface of the ground is found with most trees, is a dark layer of soil about three inches thick. This marks the level of the valley bottom before filling. The view also shows that active erosion is going on at this point causing the step to recede up stream. This recession takes place only during and after rain storms and wet weather in the spring. The material taken from here goes to build up the steps in the lower part of the valley.

But where does the material come from that is filling the valley above this step and all the way to the headwaters? All over the valley floor above this point we find fresh sand and gravel. Since there is no evidence that it comes from the sides, it must come from the collecting basins drained by the headwaters of this stream.

FIG. 3.—A view of the middle part of the valley. The forty-five-foot contour crosses on the edge of the tiny cliff. This view shows the flatness of the floor, the sharp angle between the valley sides and bottom, the buried "feet" of the tree and the stump.

The fact that the headwaters lead from cultivated lands leads one to suspect that here is the source of the material, and that the valley began to be aggraded when the forests were cut off and the soil loosened by the plow. This being so, filling must have taken place since the arrival of man in this section. Just how long ago that was, is not easy to determine from anything in the valley, except what evidence may be presented by the stump.

Evidently that seventy-five- or eighty-year-old tree started as a sapling in the valley bottom when the surface was two and one-half feet below the present surface and on a level with the upper portion of dark soil. Filling must have taken place some time within the seventy-five or eighty years. It is probable that filling has extended over many years and was and is necessarily intermittent during the year and intermittent during periods of years, less waste being furnished when the field to the west is in sod and during the dry periods of the year.

If all these suppositions be true, one would be led to make the statement that *all valleys of intermittent streams that head in cultivated fields are waste filled.* To test this generalization search was accordingly made and within a quarter of a mile from Jewell's Creek three others were found that showed essentially the same features as here described. Later, other valleys were examined, in all about a dozen, and invariably it was found that where these streams headed in cultivated fields filling was going on in the valley, the amount of filling depending upon the size of the collecting area and upon the kind of material. Not all showed steps as we have in Jewell's valley, but in most of the valleys this feature was duplicated. It was found that the steps were probably produced by bowlders or brush accumulating in the valley, causing a deposit of leaves and waste on the up-side.

The steps in Jewell's Creek as a rule are higher than any in the other valleys yet examined. The ones that are higher show evidences of their being in rapid though intermittent recession, and from indications on the sides of the valley it is believed that they started farther down the valley where stones and twigs blocked the course of the stream. How could the higher steps be produced then? Let us imagine that we have a gradual slope to the valley floor above this point of blocking, and that at some points the water in times of flood had broken through the grassy cover of the slope and had gouged out a trough with a tiny cliff at the upper portion, as we see just to the north of the walnut tree in both picture and map. Now by recession of this tiny step the cliff at the edge would become higher and higher because the new valley bottom produced by erosion would have less grade than the pre-

vious one. This seems to be the way in which the cliff in Fig. 3 was produced.

From a study of the ten or twelve valleys examined I think it is possible to make the general statements: that valleys of intermittent streams which head in cultivated fields are generally flat floored due to filling; that the filling is intermittent, being affected by kinds of crops, and wet and dry periods; that such valleys are usually characterized by steps; and that these steps are first caused by dams of stones and brush, and may become higher by recession. In all such valleys we have an interruption in the normal cycle of erosion, caused by an increase in the supply of waste brought to the headwaters; and when this supply is decreased the stream will clear away the waste and erosion will go on agreeable to the normal order.